

Timothy J. Garrett

Education

University of Washington, Ph.D., Atmospheric Sciences, 2000 (*Advisor: P. V. Hobbs*)

University of Washington, M.S. Atmospheric Sciences, 1995 (*Advisor: P. V. Hobbs*).

University of Waterloo, B.Sc. Honours Physics, 1992

Academic Positions

Assistant Professor, Meteorology Department, University of Utah, 2002 - present

Huber Fellow, Princeton Environmental Institute, Princeton University, 2000 - 2002

Refereed Publications

Zhao, C. and **T. J. Garrett**, 2007: Ground-based remote-sensing of low-level cloud properties in the Arctic. *J. Geophys. Res.*, (submitted)

Zhao, C. and **T. J. Garrett**, 2007: Ground-based remote-sensing of precipitation in the Arctic. *J. Geophys. Res.*, (submitted)

Schultz, D.M., K.M. Kanak, J.M. Straka, A.J. Durant, and **T. J. Garrett**, 2007: Reply. *J. Atmos. Sci.* (accepted)

Garrett, T. J. Observational quantification of the optical properties of cirrus cloud. Chapter in *Light Scattering Reviews, Vol. 3*, A. Kokhanovsky, ed. (accepted), 2007

Liu, C., E. Zipser, **T. J. Garrett**, J. Jiang, and H. Su, 2007: How do the water vapor and carbon monoxide "tape recorders" start near the tropical tropopause? *Geophys. Res. Lett.*, 34, L09804, doi:10.1029/2006GL029234, 2007

Garrett, T. J. and L. Verzella, 2007: Hazy perspectives of Early Arctic Explorers. *Bull. Amer. Meteorol. Soc.* (in review)

Garrett, T. J., M. B. Kimball, G. G. Mace, D. G. Baumgardner, 2007: Observing cirrus halos to constrain in-situ measurements of ice crystal size *Atmos. Chem. Phys. Discuss.*, 7, 1295-1325

Noel, V., D. M. Winker, **T. J. Garrett**, and M. McGill, 2007: Extinction coefficients retrieved in deep tropical ice clouds from lidar observations using a CALIPSO-like algorithm compared to in-situ measurements from the Cloud Integrated Nephelometer during CRYSTAL-FACE. *Atmos. Chem. Phys.* **7**, 1415-1422

T. J. Garrett, 2007: Comments on "Effective radius of ice cloud particle populations derived from aircraft probes" *J. Atmos. Oceanic. Technol.* **24**, 1492-1503.

Avey, L., **T. J. Garrett**, A. Stohl, 2007: Evaluation of the aerosol indirect effect using satellite, tracer transport model, and aircraft data from ICARTT, *J. Geophys. Res.* **112**, D10S33, doi:10.1029/2006JD007581

Garrett, T. J., L. Avey, P. I. Palmer, A. Stohl, J. A. Neuman, C. A. Brock, T. B. Ryerson, and J. S. Holloway, 2006: Quantifying wet scavenging processes in aircraft observations of Nitric Acid and CCN. *J. Geophys. Res.* **111**, D23S51, doi:10.1029/2006JD007416

Garrett, T. J., M. A. Zulauf, and S. K. Krueger, 2006: Effects of cirrus near the tropopause on anvil cirrus dynamics, *Geophys. Res. Lett.* **33**, L17804, doi:10.1029/2006GL027071

Garrett, T. J. and C. Zhao, 2006: Increased Arctic cloud longwave emissivity associated with pollution from mid-latitudes. *Nature*, **440**, 10.1038/nature04636, 787-789

Garrett, T. J., J. Dean-Day, C. Liu, B. K. Barnett, G. G. Mace, D. B. Baumgardner, C. R. Webster, T. P. Bui, W. B. Read, and P. Minnis 2006: Convective formation of pileus cloud near the tropopause *Atmos. Chem. Phys.* **6**, 1185-1200

Schultz, D. M., K. M. Kanak, J. M. Straka, R. J. Trapp, B. A. Gordon, D. S. Zrnic, G. H. Bryan, A. J. Durant, **T. J. Garrett**, P. M. Klein, and D. K. Lilly, 2006: The mysteries of mammatus clouds: Observations and formation mechanisms. *J. Atmos. Sci.*, **63**, 2409-2435.

Garrett, T. J., B. C. Navarro, C. H. Twohy, E. J. Jensen, D. G. Baumgardner, T. P Bui, H. Gerber, R. L. Herman, A. J. Heymsfield, P. Lawson, P. Minnis, L. Nguyen, M. Poellot, S. K. Pope, F. P. J. Valero, and E. Weinstock 2005: Evolution of a Florida cirrus anvil, *J. Atmos. Sci.*, **62**, 2352-2372.

Roskovensky, J. K., K.-N. Liou, **T. J. Garrett**, D. G., Baumgardner, 2004: Simultaneous Retrieval of Aerosol and Thin Cirrus Optical Depths using MODIS Airborne Simulator Data during CRYSTAL-FACE and CLAMS. *Geophys. Res. Lett.* Vol. **31**, No. 18, 10.1029/2004GL020457

Garrett T. J., A. J. Heymsfield, B. A. Ridley, M. J. McGill, D. G. Baumgardner, T. P. Bui, and C. R. Webster, 2004: Convective generation of cirrus near the tropopause, *J. Geophys. Res.*, **109**, D21203, doi:10.1029/2004JD004952

Garrett, T. J., C. Zhao, X. Dong, G. G. Mace, P. V. Hobbs, 2004: Effects of Varying Aerosol Regimes on Low-Level Arctic Stratus. *Geophys. Res. Lett.* Vol. 31, No. 17, 10.1029/2004GL019928

P. J. Popp, R. S. Gao, T. P. Marcy, D. W. Fahey, P. K. Hudson, T. L. Thompson, B. Karcher, R. L. Herman, B. A. Ridley, A. J. Weinheimer, D. J. Knapp, D. D. Montzka, D. G. Baumgardner, **T. J. Garrett**, E. M. Weinstock, J. G. Smith, D. S. Sayres, J. V. Pittman, S. Dhaniyala, P. T. Bui, and M. J. Mahoney, 2004: Nitric acid uptake on subtropical cirrus cloud particles. *J. Geophys. Res.* **109**, D06302, doi: 10.1029/2003JD004255

Gao, R. S., P. J. Popp, D. W. Fahey, T. P. Marcy, R. L. Herman, E. M. Weinstock, D. G. Baumgardner, **T. J. Garrett**, K. H. Rosenlof, T. L. Thompson, P. T. Bui, B. A. Ridley, S. C. Wofsey, O. B. Toon, M. A. Tolbert, B. Karcher, Th. Peter, P. K. Hudson, A. J. Weinheimer, and A. J. Heymsfield, 2004: Evidence that Nitric Acid increases relative humidity in low-temperature cirrus clouds. *Science*, **303**, 516-520.

Garrett, T. J., H. Gerber, D. G. Baumgardner, D. G., C. H. Twohy, and E. M. Weinstock, 2003: Small, highly reflective ice crystals in low-latitude cirrus. *Geophys. Res. Lett.*, **30**, 2132, doi:10.1029/2003GL018153.

Garrett, T.J. L.M. Russell, V. Ramaswamy, S.M. Maria, and B. Huebert, 2003: Microphysical and radiative evolution of aerosol plumes over the tropical North Atlantic Ocean. *J. Geophys. Res.*, **108 (D1)**, 4022, doi:10.1029/2002JD002228.

Garrett, T.J., L.F. Radke, and P.V. Hobbs, 2002: Aerosol effects on cloud emissivity and surface longwave heating in the Arctic, *J. Atmos. Sci.*, **59**, 769-778.

Garrett, T.J., P.V. Hobbs, and L.R. Radke, 2002: High aitken nucleus concentrations above cloud tops in the Arctic, *J. Atmos. Sci.*, **59**, 779-783.

Wendisch, M., **T. J. Garrett**, and W. Strapp, 2002: PVM-100A liquid water content probe response to large droplets. *J. Atmos. Ocean. Tech.*, **19**, 1577-1584.

Garrett, T.J., P.V. Hobbs, and H. Gerber, 2001: Shortwave, single-scattering properties of arctic ice clouds, *J. Geophys. Res.*, **106**, 15,155-15,172.

Curry, J. A, P. V. Hobbs, M. D. King, D. A. Randall, P. Minnis, G. A. Isaac, J. O. Pinto, T. Uttal, A. Bucholtz, D. G. Cripe, H. Gerber, C. W. Fairall, **T. J. Garrett**, J. Hudson, J. M., Intrieri, C. Jakob, T. Jensen, P. Lawson, D. Marcotte, L. Nguyen, P. Pilewskie, A. Rangno, D. C. Rogers, K. B Strawbridge, F. P. J. Valero, A. G. Williams, D. Wylie, 2000: FIRE Arctic Clouds Experiment. *Bull. Amer. Meteor. Soc.*, **81**, 5-29.

Durkee, P. and co authors, 2000: The impact of ship-produced aerosols on the microstructure and albedo of warm marine stratocumulus clouds: A test of MAST hypotheses 1i and 1ii. *J. Atmos. Sci.*, **57**, 2554-2569.

Ferek, R.J., **T.J. Garrett** and co-authors, 2000: Drizzle suppression in ship tracks. *J. Atmos. Sci.*, **57**, 2707-2728.

Hobbs, P.V., **T.J. Garrett**, and co-authors, 2000: Emissions from ships with respect to their effects on clouds, *J. Atmos. Sci.*, **57**, 2570-2590.

Hudson, J.G., **T.J. Garrett**, P.V. Hobbs, S.R. Strader, Y. Xie, and S.S. Yum, 2000: Cloud condensation nuclei and ship tracks. *J. Atmos. Sci.*, **57**, 2696-2706.

Noone K. J., D. W. Johnson, J. P. Taylor, R. J. Ferek, **T. Garrett**, P. V. Hobbs, P. A. Durkee, K. Nielsen, E. Öström, C. O'Dowd, M. H. Smith, L. M. Russell, R. C. Flagan, J. H. Seinfeld, L. De Bock, R. E. Van Grieken, J. G. Hudson, I. Brooks, R. F. Gasparovic, and R. A. Pockalny, 2000: A Case Study of Ship Track Formation in a Polluted Marine Boundary Layer. *J. Atmos. Sci.*, **57**, 2748-2764.

Noone, K. J., D. W. Johnson, J. P., Taylor, R. J. Ferek, **T. Garrett**, P. V. Hobbs, P. A. Durkee, K. Nielsen, E. Oestrom, C. O'Dowd, M. H. Smith, L. M. Russell, R. C. Flagan, J. H. Seinfeld, L. DeBock, R. E. Van Grieken, J. G. Hudson, I. Brooks, R. F. Gasparovic, I. Brooks, 2000: A case of ships forming and not forming tracks in moderately polluted clouds, *J. Atmos. Sci.*, **57**, 2729-2747.

Gerber, H., Y. Takano, **T. J. Garrett**, and P. V. Hobbs, 2000: Nephelometer measurements of the asymmetry parameter, volume extinction coefficient, and backscatter ratio in clouds. *J. Atmos. Sci.*, **57**, 3021-3034.

Garrett, T.J. and P.V. Hobbs, 1995: Long-range transport of continental aerosols over the Atlantic Ocean and their effects on cloud structures. *J. Atmos. Sci.*, **52**, 2977-2984.

Other Publications

Kimball, M. B. and **T. J. Garrett**, *Constraining cirrus ice crystal size through observation of halos*. 12th Conference on Cloud Physics and Radiation, Madison, Wisconsin, 2006

Avey, L., **T. J. Garrett**, and A. Stohl, *Evaluation of the aerosol indirect effect using satellite, chemical transport model, and aircraft data from ICARTT*, 12th Conference on Cloud Physics and Radiation, Madison, Wisconsin, 2006

Zhao, C. and **T. J. Garrett**, *Ground-based retrieval of seasonal cloud and precipitation properties in the Arctic*, 12th Conference on Cloud Physics and Radiation, Madison, Wisconsin, 2006

Garrett, T. J., H. Gerber, D. G. Baumgardner, M. Poellot, C. H. Twohy, and E. M. Weinstock, *Microphysical relationships in CRYSTAL-FACE anvil cirrus*. International Conference on Clouds and Precipitation, Bologna, Italy, 2004

Garrett, T. J., X. Dong, G. G. Mace, C. Zhao: *Effects of arctic haze on clouds and the surface radiation balance*. Seventh Conf. on Polar Meteorology and Oceanography and Joint Symposium on High Latitude Climate Variations, , Hyannis Mass., 16-23 May 2003.

Garrett, T. J.: *Radiative Properties of Arctic Clouds*. Ph. D. Dissertation, University of Washington, 2000.

Garrett, T. J. and P. V. Hobbs, 1999: *Calibration of liquid water probes form the University of Washington's CV-580 aircraft at the Canadian NRC wind tunnel*.

Garrett, T. J. in collaboration with the Curriculum Development Unit of Tonga: *Form 3: Weather and the Sea*. Ministry of Education, Kingdom of Tonga, 1997.

Garrett, T. J.: *Ship Tracks: An Example of Aerosol-Cloud Interactions*. Masters Thesis, University of Washington, 1995.

Recent Invited Presentations

Is Arctic sea-ice melting stimulated by aerosol-cloud-radiative interactions? Gordon Conference on Radiation and Climate, July, 2007.

Is the Cloud System Homeostatic? Dalhousie University, Canada, May, 2007

Arctic Haze and Winter Warming Arctic Climate Workshop sponsored by Clean Air Task Force, NASA GISS, January, 2007

Pollution and the Arctic: 200 years of Man-Made Climate Change, Wallace Stegner Center,
University of Utah, October 2006

Exploring Pollution-Cloud-Climate Interactions in the Arctic, State University of New York,
September 2006

Exploring Pollution-Cloud-Climate Interactions in the Arctic, Brookhaven National Laboratories,
September 2006

Teaching

Courses

Undergraduate *Physical Meteorology, Meteorological Analysis*

Graduate *Radiative Transfer and Climate; Advanced Cloud Physics; Physical Meteorology*

Graduate Students Advised

Bradley Navarro. M. S. 2003

Nathaniel Mullins M. S. 2005

Margaret Kimball M. S. 2006

Lance Avey M. S. 2006

Chuanfeng Zhao Ph. D. 2007

Stina Söström, M. S. Uppsala University, 2007

Kyle Tietze, 2007 - present

Clint Schmidt, 2007 - present

Graduate Student Committees

Eric Vernon, M.S., 2002

Yuying Zhang M.S., 2002

Yaping Li, M.S. 2002

Haiyan Jiang, Ph.D. 2004

Kristen Dowd, M. S. 2004
Yuying Zhang, Ph. D. 2006
Ryan Riveland, M. S. 2006
Helena Schlueter, M. S. 2006
Daniel Hartsock, M.S. 2006
Jennifer Esker, M. S. 2006
Scott Robertson, M. S. 2007

Service

Editor, 2007, - *Atmospheric Chemistry and Physics*
Associate Editor, 2003-2007, *Journal of Atmospheric Sciences*
Panel Review Committee for NOAA Office of Global Programs, October, 2004
Journal article reviewer for AMS, AGU, EGU and IEEE journals, *Nature* and *Science*
Proposal reviewer for NASA, NSF, DOE, and NOAA
Member ISDAC Science Team (2006-present)

Awards

Honors

New Investigator Award, NASA, 2006
Huber Fellowship, Princeton Environmental Institute, Princeton University, 2000 - 2002
Atmospheric Chemistry Colloquium for Emerging Senior Scientists (ACCESS), Invited participant, 2002
Outstanding Student Paper Award, AGU Fall Meeting, 1999

Externally Awarded Research Proposals

(Total \$1,683,644)

1. **NASA Optical Properties of Tropical Cirrus Clouds.** P. I. T. J. Garrett, Co-P.I. H. Gerber.
\$136,389. 01/2002 - 01/2004.

2. **NSF** *Aerosol-Cloud-Radiation Interactions in the Arctic.* P.I. T. Garrett, co-P.I. Xiquan Dong, Gerald G. Mace. \$339,503. 04/2003 - 04/2006.
3. **NSF** *New Approaches for the Measurement of Microphysics in Extratropical Hurricanes.* P.I. T. J. Garrett. \$19,946, 07/2003 - 07/2004.
4. **NOAA** *2003 Aerosol-cloud-climate interactions downwind of North Eastern North America.* P.I. T. J. Garrett. \$351,234. 03/03 - 03/06.
5. **NASA** *Airborne Studies of Middle and Low-Latitude Cirrus.* P. I. T. J. Garrett. \$86,882. 01/04-01/05.
6. **NSF** *Formation and evolution of pileus cloud near the tropopause.* P. I. T. J. Garrett \$35,693. 1/1/06 - 12/31/06.
7. **NASA** (New Investigator Program Award) *Interaction between microphysics, radiation and dynamics in terrestrial cirrus.* P. I. T. J. Garrett \$339,976. 8/1/06 - 7/31/09.
8. **NSF** *Evaluation of Aerosol-Cloud-Radiation Processes and Feedbacks in the Alaskan Arctic.* P.I. T. J. Garrett \$324,121 6/1/07-5/30/10.
9. **Clean Air Task Force** *Quantifying the significance of mid-latitude pollution plumes to clouds and sea-ice melting in the Arctic,* \$50,000 6/1/07-5/30/08.

Field Work

NASA CRYSTAL-FACE, Summer 2002: Integrated Cloud Integrating Nephelometer (CIN) onto the NASA WB-57 aircraft for the study of Florida anvil cirrus.

CNRC ETHEX, Fall, 2003: Integrated CIN onto Canadian National Research Council CV-580 Airborne Facility for flight into mid-latitude Hurricane systems.

NASA MidCiX, Spring, 2004: Integrated CIN onto the the NASA WB-57 for the study of mid-latitude and sub-tropical anvil cirrus.

NOAA ICARTT, Summer, 2004: Integrated CIN, FSSP-100 and OAP 2D-C onto NOAA and CNRC aircraft for the study of the effects of North American pollution on cloud radiative properties.

Professional Memberships

American Meteorological Society. 2000 - present

American Geophysical Union 1998 - present